Landfill Methane Regulations and Canada's efforts to reduce waste sector methane emissions

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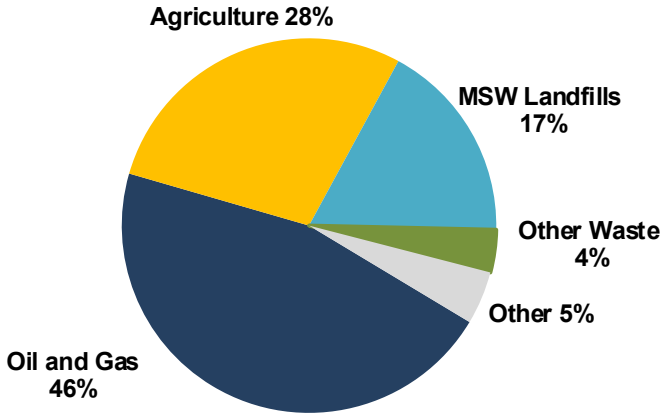
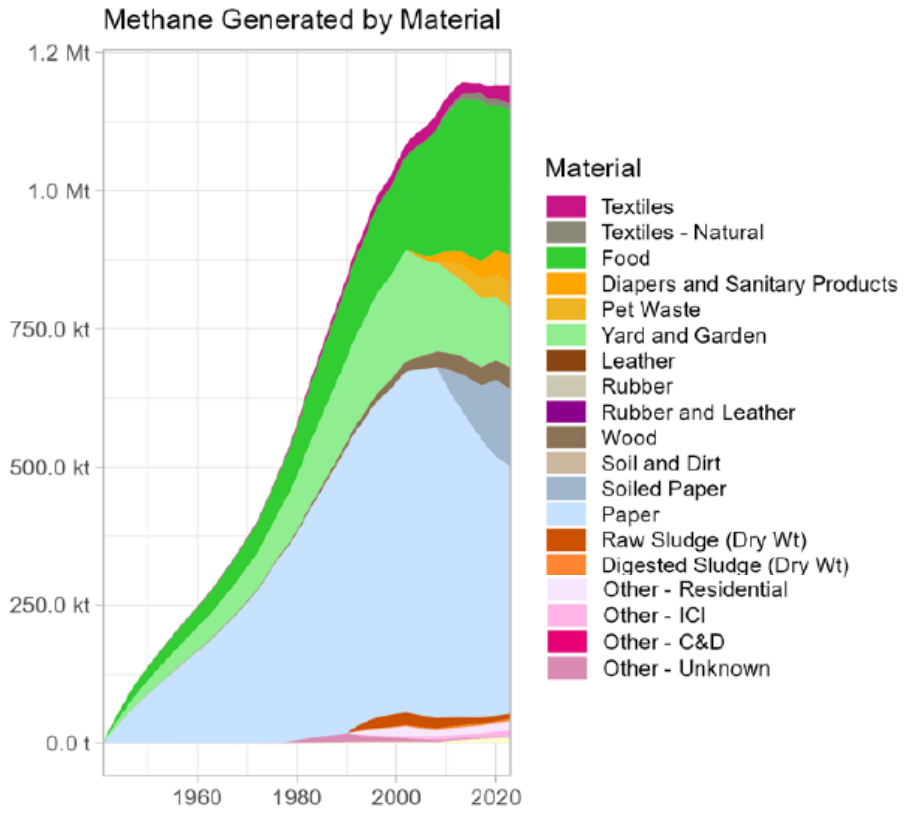
CANADA'S GHG AND METHANE REDUCTION COMMITMENTS

- Reducing methane emissions is the strongest measure that can be taken to slow down climate change over the next 25 years
- Canada has committed to:
  - Reducing GHG emissions by 40-45% below 2005 levels by 2030 and 45-50% by 2035
  - Achieving net-zero GHG emissions by 2050
  - Supporting the Global Methane Pledge to reduce global methane emissions by 30% below 2020 levels by 2030



Canada's 2023 Methane Emissions, by sector (NIR, 2025)

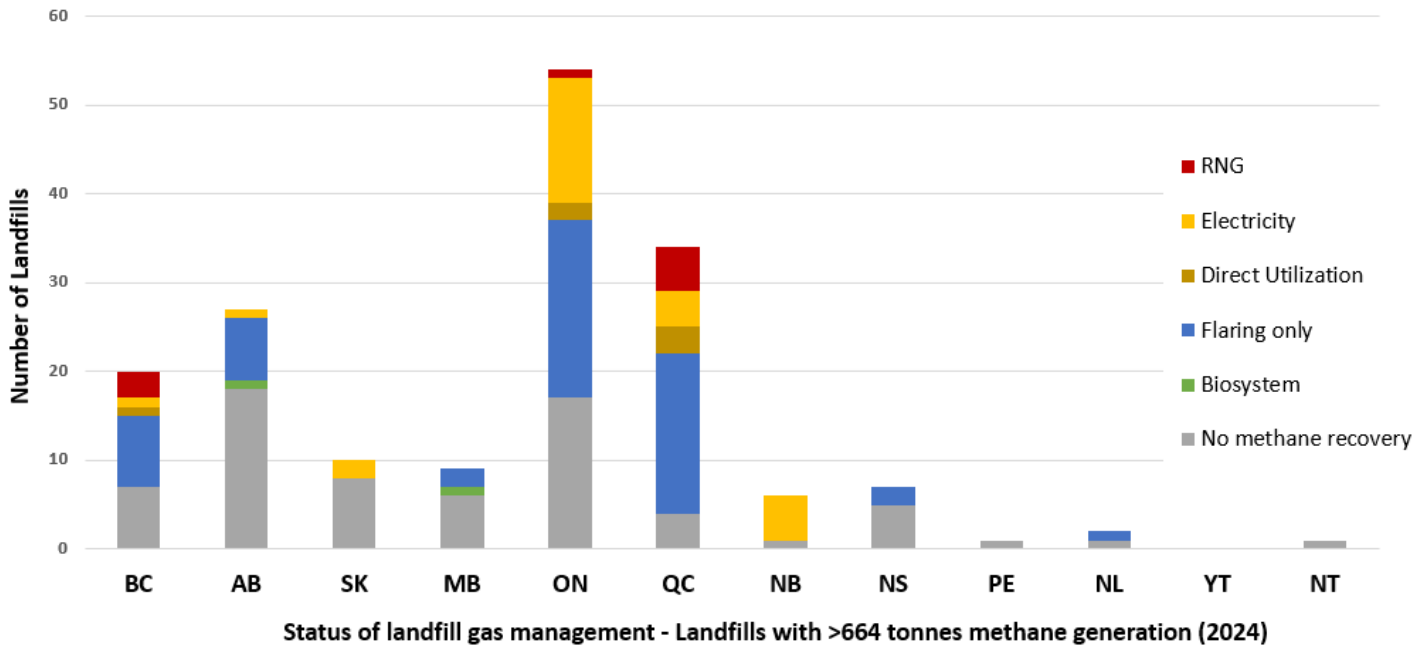


Waste Sector Emissions

- Biodegradable waste disposed in landfills is the source of methane emissions and over 60% of Canada's MSW is biodegradable

REDUCING EMISSIONS - LANDFILL GAS MANAGEMENT

- Only approach available to mitigate emissions from waste already disposed in landfills
- There are about 112 landfill gas recovery systems in Canada that recover about 37% of the estimated methane generated
  - 12 of the 73 AB/SK/MB/NT landfills in the inventory have LFG recovery systems
- Increasing trend towards RNG production – both new utilization projects and those converting from existing electricity generation



ECCC LFG Inventory

- 68% of MSW from AB/SK/MB/NT disposed in ECCC LFG Inventory landfills
- 23% of MSW from AB/SK/MB/NT disposed at landfills with LFG recovery systems
- 74% of recovered methane is flared and 26% utilized to produce electricity
  - Electricity – 3 projects and 1 under consideration
  - RNG - no existing projects and 2 under development

FEDERAL LANDFILL METHANE REGULATIONS

- The federal Landfill Methane Regulations came into force on December 12, 2025.
- New federal regulations aim to:
  - Increase the number of landfills taking action to reduce methane emissions
  - Ensure methane control is being optimized
  - Increase the detection and repair of methane leaks
- Regulations will apply only to landfills that exceed both waste disposal and methane generation thresholds
- Requirements include:
  - Limits on venting of landfill gas
  - Surface methane concentration limits and regular monitoring
  - Monitoring LFG recovery equipment and landfill gas recovery wells to detect methane leaks
  - Resolve detected leaks and exceedances of limits within specified timelines.
- Methane control requirements are phased in over time – certain landfills will need to comply by 2028 (existing LFG systems) and others at later dates (2029/2035) depending on how much methane they generate.

Waste Disposal Thresholds

- 450,000 tonnes WIP and received waste after Jan 1, 2010

or

- 200,000 tonnes WIP and receive more than 20,000 tonnes of waste per year in 2025 or later

↓

Methane Generation Thresholds

Open landfills - more than 664 tonnes/yr
Closed landfills - more than 1000 tonnes/yr

↓

Regulations will apply to an estimated **146 landfills**

↓

50% reduction potential by 2035
(from projected baseline methane emissions)

REGULATORY MONITORING REQUIREMENTS

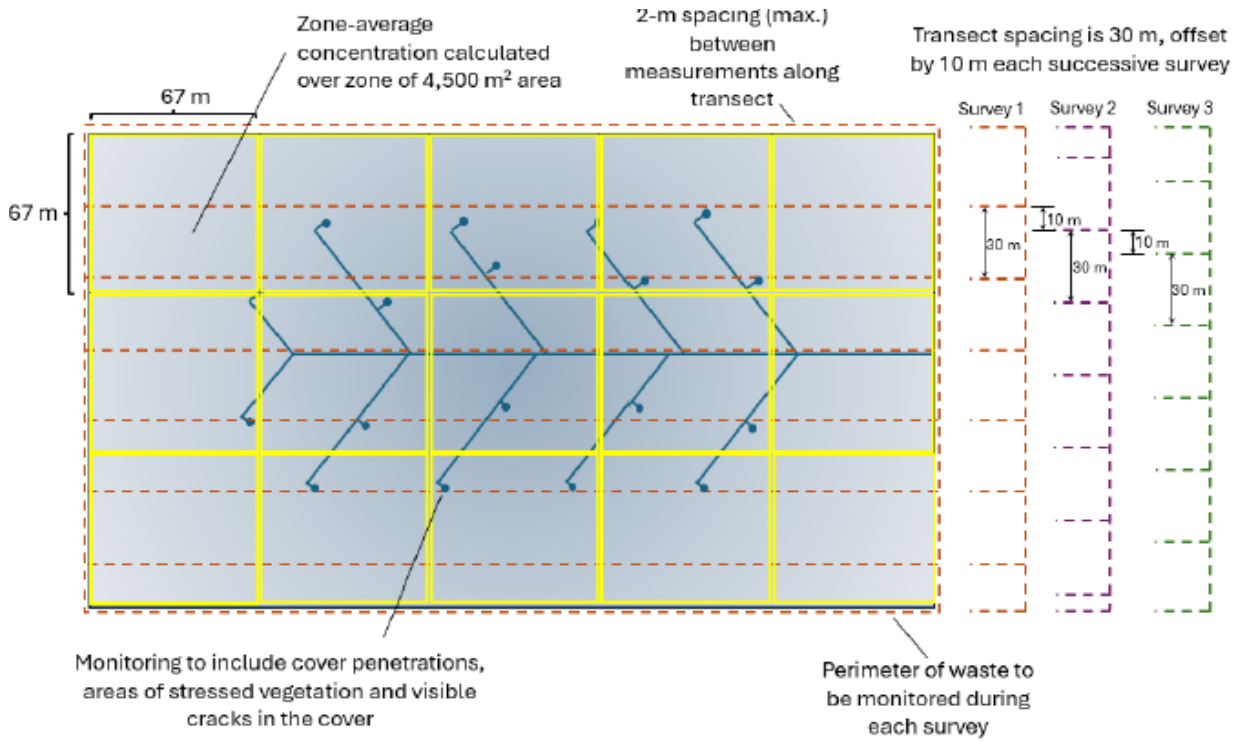
- Surface methane concentrations on the landfill must not exceed following limits:
  - 500 ppmv in a single location
  - 25 ppmv zone-average (average of measurements recorded in an area of ~4,500 m^2)

  ➢ Monitoring landfill surface methane concentrations (SEM) required 3 times per year

- Monitoring to detect methane leaks in LFG management system equipment components required 3 times per year
  - A leak is a location with methane concentration ≥500 ppmv

- Monitoring at landfill gas recovery wells required monthly

  ➢ To detect the following conditions that may be resulting in methane emissions:
  - gauge pressure > 0.5 inches water
  - oxygen content >5%
  - absence of landfill gas flow
  - damaged wellhead components



- Once leaks or exceedances are detected, regulations require follow-up actions to develop plan or eliminate leak or exceedance within specified timelines.

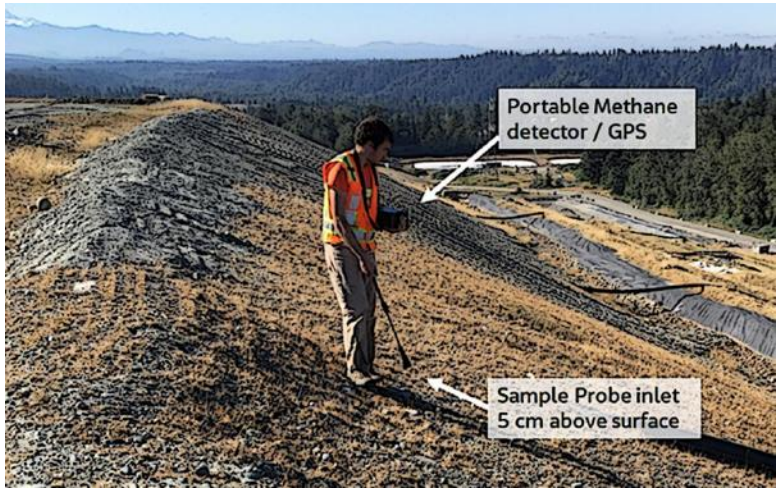
REGULATORY MONITORING METHODS

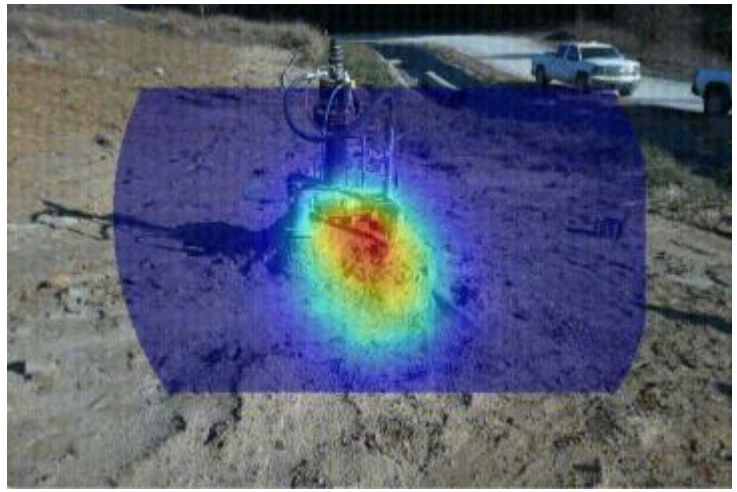
Regulatory Methods

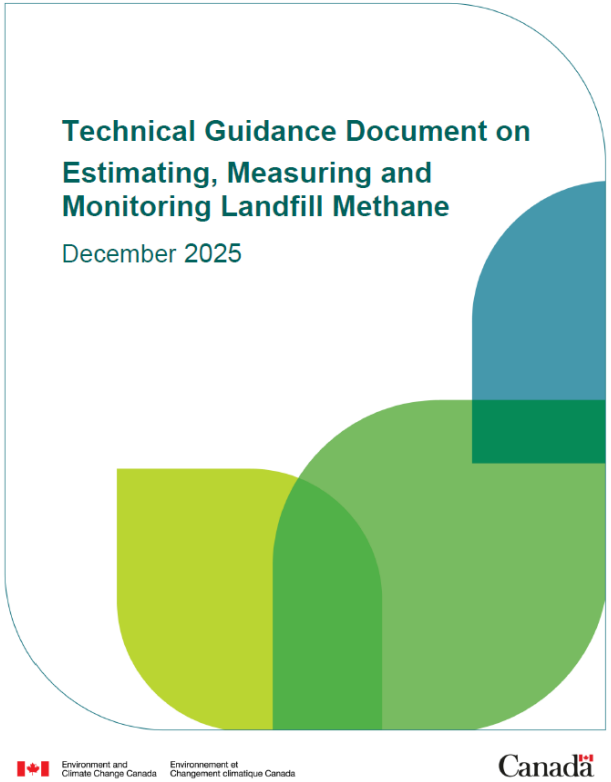
- Surface methane concentrations:
  - Hand-held or drone-mounted methane sensors that measure in units of ppmv or an approved alternative method
- Methane equipment leaks:
  - Hand-held methane sensors or an approved alternative method
- Landfill gas recovery wells:
  - No methods specified in regulations; industry standard instruments

Alternative Methods

- Alternative methods for both equipment leaks and surface methane concentrations allowed once published in ECCC's TGD.
- Alternative methods must be capable of identifying the same leaks and exceedances as regulatory monitoring program.

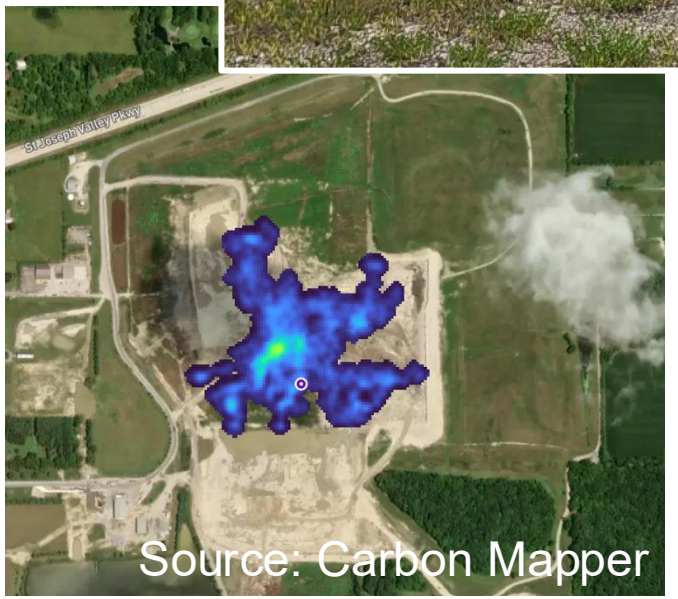






MEASURING AND MONITORING WASTE SECTOR METHANE EMISSIONS

- New approaches to measure and monitor methane emissions at landfills are advancing:
  - airborne surveys (drone-based or aircraft-based) that can quantify emissions or pinpoint leaks
  - satellite technology that can repeatedly estimate emission rates
  - fixed ground sensors that continually measure methane concentrations across the landfill or along the boundary
- Research to assess their reliability in the landfill setting
  - Fluxlab controlled release testing at Petrolia Landfill
  - waste operators piloting different technologies
- Potential uses of methane emissions measurements:
  - ECCC is evaluating use of measured emission rates in GHG inventories
  - assessment and refinement of ECCC methane generation model
  - potential use in regulatory context (need to achieve equivalency)
  - operational use to inform mitigation



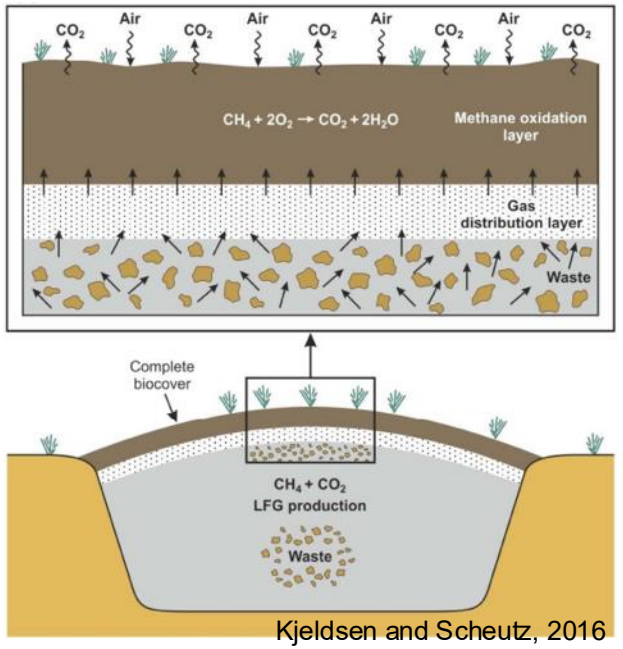
Source: Carbon Mapper

ADDITIONAL MITIGATION APPROACHES

Other approaches to mitigate landfill methane emissions are advancing:

Biosystems

- Biocovers, biowindows and biofilters convey landfill gas through engineered systems that allow microorganisms to break down methane into carbon dioxide
- They may be appropriate where active landfill gas systems are not technically feasible or have been decommissioned.
- ECCC is aware of approximately 12 landfill biosystems in Canada



Kjeldsen and Scheutz, 2016

Automated wellfield tuning

- Wellhead technology and control algorithms continuously monitor collection wells and make continuous, incremental valve adjustments to maximize the collection of methane from the whole wellfield
- 2-3 Canadian landfills are using these; more in the US


Source: Apis

Active face emission management

- Active face has been identified as major source of methane emissions
- Landfills are installing collection systems in new cells to achieve earlier gas recovery
- Minimizing active face area also contributes to lower emissions

SUPPORTING LANDFILL METHANE RESEARCH

ECCC delivered $1.7M in funding for projects implemented by technology providers, environmental professionals, academia, and municipal landfill owners to undertake landfill methane research.

Landfill emissions measurements:

- First ever large-scale survey of emission rates in Canada (measurements at 80 landfills across Canada using variety of approaches)
- Survey of active face emission rates under a range of operational practices

Evaluation and comparison of methods:

- Several projects were funded that deployed and compared numerous technologies at one site
- Technologies included handheld and drone-mounted methane detectors, and airborne and satellite methane measurement systems

Piloting and improving landfill biosystems:

- Pilot of landfill biowindows to support design optimization
- Study of methanotrophs to develop recommendations for optimal design of cover soils to promote methane oxidation
- Installation and comprehensive monitoring of a test pad biocover
- Development and testing of automated monitoring system for biosystems

Assessing technology:

- Testing of fixed continuous methane monitoring devices to identify diffuse and simultaneous emission sources
- Installation and assessment of automated wellfield tuning equipment

FLUX LAB gas detection measurement

UDS Université de Sherbrooke

University of Waterloo

QUBE

Carbonaxion

City of Vancouver

SperoAnalytics

COMCOR

Comox Valley Regional District

METHANEX Methane Expert Engineering Ltd

Western University · Canada

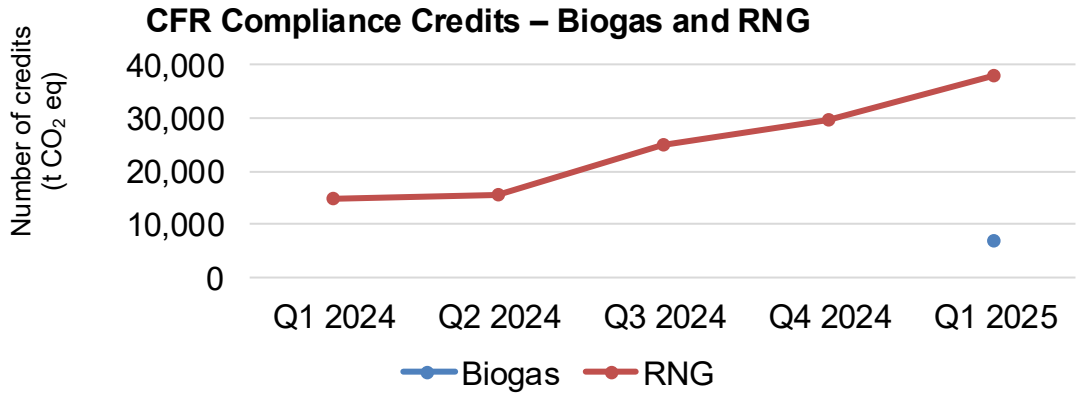
FEDERAL CREDIT MARKET OPPORTUNITIES

The federal *Clean Fuel Regulations* and *Greenhouse Gas Offset Credit System* have created new revenue opportunities for waste sector projects that reduce landfill methane emissions and create energy from landfill gas and organic waste.

	Canada's GHG Offset Credit System – Federal Offset Protocol for Landfill Methane Recovery and Destruction	**Clean Fuel Regulations – Category 2 and 3 Compliance Credits**
Project Activities	Landfill gas recovery and destruction of methane in flares, engines, boilers or processing in energy production systems (RNG).	Landfill gas or AD projects that: • Produce RNG (pipeline or transportation) • Produce electricity from biogas
Eligible locations	Across Canada – except in BC, AB, QC	Across Canada - projects that supply eligible fuel or energy
Credit generation	Credits generated for landfill methane emissions that would have occurred without project = avoided landfill methane emissions	Credits for displacement of fossil-based fuels and energy; avoided landfill methane emissions
Projects in systems	1 project registered – 4,974 credits issued (t CO_2 eq) in 2025	

Impact of Landfill Methane Regulations on offset credits

- non-regulated landfills are not impacted (smaller, closed below methane generation thresholds)
- regulated landfills: subset of regulated landfills have 2035 compliance date, extending eligibility to generate offsets for early, voluntary LFG recovery



ORGANICS DIVERSION - EXAMINING BARRIERS AND OPPORTUNITIES

82% of Canada's population lives in a community with a curbside SSO program for SF households.

Mandatory MR SSO diversion requirements vary across Canada but are increasing in number.

Municipal regulations for ICI sector organics diversion are not common.

What we heard – Key action areas...

- Policy frameworks, regulatory requirements and municipal source separation bylaws to encourage new programs and support increased participation in existing programs
- Funding or financial incentives for infrastructure but also for municipal programs to increase participation through enforcement and education
- Collection and reporting of data to assess performance and inform policy/program development
- Best practices for program design and implementation and for communications approaches
- Evolving concerns related to compost and digestate quality are potential limitation to adding compostable materials to SSO programs

ECCC studies have focused on collecting perspectives from municipalities and waste sector experts :

- Municipal perspectives on influencing organics diversion in single-family residences (2025)
- Overview of Multi-Family Residential Waste Diversion Across Canada (2024)
- Investigating Barriers, Drivers, and Opportunities that Influence IC&I Organic Waste Diversion in Canada (2025)
- The Role, Management, and Impacts of Plastics in Organic Waste Diversion Programs in Canada (2023)
- Municipal views on acceptance of pet waste and soiled paper in SSO programs (2025)

THANK YOU!

For further info, please contact us at:

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Waste and greenhouse gases: Canada's actions - Canada.ca